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萨拉乌苏河 晚第四纪地质与古人类综合研究

内蒙古博物院

华南师范大学地貌与区域环境研究所

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内 容 简 介

本书是著者 40 年来从事萨拉乌苏河晚第四纪地质和古人类综合研究的成果集成。全书内容丰富,资料翔实,观点新颖,分九章分别对萨拉乌苏河地区的科学研究进行回顾与评论,对第四纪地层及其沉积相特征、地层划分与对比、脊椎动物化石、古人类化石、旧石器文化、气候与环境变化、新构造运动和自然环境演化进行了阐述。本书对全面了解和研究萨拉乌苏河地区的研究历史、晚第四纪地层类型与分布、沉积相、古脊椎动物、古人类及其旧石器的地质时代与文化期、区域气候环境变化及其与全球变化的联系、新构造运动与自然环境演化过程及成因等方面,具有重要的参考价值。同时,对进一步推进萨拉乌苏河文化遗址和地质公园的保护与建设、教学实习、科学普及和当地旅游业的发展等,也有重要的实践意义。

本书可供从事地貌与第四纪地质、史前考古、文物保护、自然地理和旅游等方面的科研院所研究人员、高等院校师生等参考。

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序一 萨拉乌苏的落日和萨拉乌苏文化

(刘东生院士 中国科学院地质与地球物理研究所)

2006年8月9日傍晚,当我在刚刚落成的、颇具欧洲风格的萨拉乌苏宾馆里和大家一起用餐的时候,忽然抬头看见窗外一轮红日正在向西方缓缓地落去——萨拉乌苏的落日!它是那样鲜艳动人。它使我惊奇大自然之美,更使我惊奇,是它在83年前引起了一位西方科学家的哲学思想的诞生。虽然这是我第一次看到萨拉乌苏的落日,但我觉得像见到盼望已久的老朋友似的感到亲切。

这就是我们这些地质学家、旧石器考古学家、古生物和人类学家们从世界各地赶来鄂尔多斯大沙漠南缘的草原上,在这条细水长流的萨拉乌苏河畔聚会的缘故吧!庆祝草原文化节,感受萨拉乌苏文化,纪念1922~1923年法国神父桑志华(E. Licent)、德日进(P. Teilhard de Chardin)第一次在中国土地上,实践西方现代古生物学、人类考古学的历程和检视83年来人们在这里所取得的新成就。这是83年来又一次西方文化和东方文化的碰头聚会。一次真正意义的欧亚草原文化的讨论。

饭后走到院子里,看到宾馆前面水库尽头那没入贺兰山的冉冉落日,它那变幻的光辉不正是当年引起德日进思索过去地球的历史和发展中的人的未来的落日么!但是今天,我们这些来自世界各地的科学家们谁也没有见过世界著名的古生物学家德日进和桑志华,我们是又一代的人了。萨拉乌苏神奇的落日,给人们带来了惊奇和沉思。它像流淌着的萨拉乌苏河一样,成为草原文化的一个象征。它将是人们永远记忆着的萨拉乌苏的落日。它将永远引起人们的想念和思考。

为什么纪念萨拉乌苏文化?

萨拉乌苏是中国第四纪陆相地层中,特别是生物地层学系统中一个标志名称。在中国有泥河湾(早更新世)、周口店(中更新世)、萨拉乌苏(晚更新世)三个代表不同时代的地层名称。这三个第四纪标准地层是在科学上规定了的。那就是说,从命名之日起,以后所有晚第四纪(即晚更新世)地层需要以萨拉乌苏(组)为标准进行比较。这就是萨拉乌苏之所以有名和吸引人们来此的缘故之一吧!更何况从去年(2005)起国际地层委员会发起了讨论世界第四纪地层命名问题的建议,现在人们更需要从萨拉乌苏来寻找解答。

萨拉乌苏的第二个特点,它是中国最早发现早期人类石器工业的地点之一。萨拉乌苏石器工业,以细小的石器为特征,并使用骨器,属于旧石器中晚期文化。它不仅在中国是一个标准地点,而且在中西文化交流史中占有重要的地位。人们将在这个草原上找到中国鄂尔多斯通往欧洲大道的灵感。

萨拉乌苏的第三个特点,恐怕也是一个最重要的特点了,那就是在此地的地层里找到了人类的化石——河套人(the Ordos tooth)。当年桑志华和德日进仅找到一个属于儿童的门齿。但就是这一个门齿,打破了寂静的亚洲大地,成为从地层中发现人类祖先的先声。自那以后,

人们不停地思考着为什么萨拉乌苏人和身躯庞大的象和犀牛这样大型动物在一起,为什么和飞奔的野马和鹿同在并留下了吃饭用的刀叉(石器)。

人们更要询问,萨拉乌苏在几万年以来是一直像现在这样干旱,还是气候环境有了变化?是人改变了周围的生物和环境?还是气候环境的更替使人在变化?或者这两者都有关系?

这就是开会以前人们对萨拉乌苏的了解和认识。

从2006年8月8~12日在“鄂尔多斯萨拉乌苏遗址国际学术研讨会”之前大家参观了在乌审旗的博物馆,在开会期间听了董光荣等许多位同志的报告,并在他们的指引下参观了现场,阅读了《萨拉乌苏河晚第四纪地质与古人类综合研究》(初稿)。这本专著使我们对萨拉乌苏有了许多新的认识。书中对萨拉乌苏河(以下简称萨拉乌苏)这一地点的研究历史,这里的自然地理景观和这里的地层、古生物、石器、古人类以及地球化学环境等都做了很好的总结和分析。在这里我就不详细介绍了。我想说的是,在这本专著中有许多亮点,应该提出和提倡。

一本科学研究著作,它是著者们多年艰辛工作和深入思考的结晶。对于读者来说,它的预见性和启示性往往要比它的综合性和总结性更会引起人们的注意。

《萨拉乌苏河晚第四纪地质与古人类综合研究》一书(以下称本书),有三个突破性的成就和启发。其中之一是地层学上突破性的成就。著者等对萨拉乌苏地层学建立了一个全新的“气候地层学系统”。董光荣、李保生等同志,在详细的岩石地层学、生物地层学和年代地层学研究的基础上,采用以前孙继敏等人在这里所用的深海氧同位素阶段(Marine Isotope Stages)系统,以新的方法和手段,对萨拉乌苏地层(包括萨拉乌苏组、城川组等)进行了气候地层的划分和解译。这在中国第四纪陆相地层的划分和命名上,虽然并不是第一次尝试,但却是一次成功的尝试。它使萨拉乌苏第四纪地层划分基本上达到可与国际通用的深海和南极冰心氧同位素阶段(MIS)对比的水平。这一新的气候地层观,首先是对地层的时代划分比以前更精细准确了。并且把地层从一个区域性的地质研究提升到全球气候变化地层系统的框架中,使萨拉乌苏的地层学研究真正进入于全球变化的研究之中。

在陆相第四纪地层中,气候地层学和生物地球化学的研究是密不可分的。而萨拉乌苏这一地区巨厚的沉积以及沉积物组合规律性和变化性,都非常有利于在中国建立一个代表晚更新世以来全球变化的大陆沉积“气候地层学系统”的标准剖面。

为此需要地质古生物学工作者和考古工作者一样,甚至要在全剖面上,像深海沉积、南极冰心和黄土沉积一样进行研究。应当看到今后气候地层学的研究将是整个研究第四纪地质历史的基础。无论是讨论今后气候变化问题,还是土地改良问题,或者修复生态环境问题,都离不开对过去环境的历史演变过程的了解。

本书另一个突破和启发是古生物学的工作开辟了新的“古生态学研究”的道路。除对已有的发表过的,和现有的新发表的化石材料做了系统而详细的描述、研究外,最为宝贵的思路和工作是对现在所知、重要的萨拉乌苏动物群的综合分析和归纳。这一工作使萨拉乌苏的研究由一个点上升为一个面的研究。而这种研究如与“气候地层学系统”相配合,它将开辟一个新的陆相地层研究,将超过深海沉积、冰心和黄土的研究。

因为如果我们从全球变化的角度来衡量这几种沉积物,深海沉积物中除海相微体动物外缺乏其他动植物,冰心中则生物更是稀少,黄土中虽然有少量动、植物化石,但很难据之完全

恢复当时陆地生物圈的面貌。过去的生物地层剖面,常因地点孤立,难以形成一个区域的古生态环境认识,所以难以进入真正的全球变化研究的领域。本书中所列出萨拉乌苏生物群的分布,最东从河北迁安,向西到山西许家窑、峙峪以及更西的甘肃楼房子等。而城川动物群则从黑龙江的顾乡屯到辽宁大连古龙山到北京山顶洞、田园洞,到陕西涝池河到萨拉乌苏以南甘肃华池的柔远城子都有其踪迹。这一东西向延长的自然地理范围和生态环境,在中国乃至世界的全球变化研究中都具有重要意义。需要再进一步,以深海氧同位素的气候年代为纲,以自东而西的区域分布为辅,进行古生物学和古生态学研究,是能够对全球气候变化与生物演化做出贡献的。它将使萨拉乌苏成为一个陆相地层、全球变化研究的核心。

再一个突破和启发就是本书对萨拉乌苏石器、古人类及其文化的综合研究。这项研究十分深入而详细、材料丰富、并极具挑战性。黄慰文等同志同意德日进等人的分析,认为萨拉乌苏人曾有狩猎行为。这就使我想到从 20 世纪 60 年代以来美国 P. 马丁 (Paul Martin) 教授一直提倡,更新世晚期后大型哺乳动物在全世界的消失与人类的大规模的狩猎有关的学说。我对此学说甚感兴趣,因为从西部萨拉乌苏组和城川组这两个时代相连接的地层中,可以粗略地看出,萨拉乌苏组人类化石及石器丰富,其中大型哺乳动物遗骸不仅多而且有被人工破坏的迹象,而城川组中则很少发现这一现象。反之,在东北(顾乡屯,榆树)等地时代较新相当于城川组中,则大型哺乳动物不仅增多,而且也有被猎杀的现象。这些蛛丝马迹启发我们想到,在巨大的自然界变化之中,人——猎人——在起着重要的作用。像 Paul Martin 最近提到的世界各地的大型哺乳动物的消失,因地而异,如在澳大利亚距今为 46000 年前,在美洲为 13000 年前,而西印度群岛为 5000 年前,这是与人 (*Homo sapiens*) 的到达先后的时间有关。是否如此,还有待科学予以证明。但是,有一点是清楚的,即如果要研究这一问题,证明其是与否,萨拉乌苏无疑将是最为有利的地点之一。因此可以说这本专著提出了一个新的具有世界意义的“萨拉乌苏狩猎文化”。

另一个由萨拉乌苏文化所引起的思考,就是关于最近讨论较多的“人类世”(Anthropocene)是由什么时候开始的问题。2000 年诺贝尔奖获得者 P. 克鲁岑 (Paul Crutzen) 等人提出以 1786 年瓦特发明蒸汽机为代表的工业革命为人类世的开始,因为人类活动对地球环境的影响(温室气体导致气候变化)开始超过自然地质作用。而后美国学者 W. 拉迪曼 (Williams Ruddiman) 提出以农业开始(土壤中温室气体甲烷大量释放)作为人类世的开始。我想萨拉乌苏的研究,对萨拉乌苏狩猎文化的研究(狩猎、熟食、用火,石器骨器工具制作等),对于草原生态文化的研究已初步显示,狩猎不仅是生活和生产的活动,而且是人最早改变全球环境的开始。人的狩猎活动造成的影响不仅在大气圈、而且在生物圈和土壤圈与岩石圈都相当巨大,和自然界的地质营力所造成的影响相比有本质的变化。人类真正成为一个不可忽视的地质营力,应该是从狩猎时代开始。所以萨拉乌苏的研究,启发我们提出“人类世”应从狩猎时代开始,进而我想到随人的狩猎,各地在萨拉乌苏组和城川组中所反映的大规模猎杀、用火等改变自然环境的行为是有先后的,就可以理解了。借此机会提出来向大家请教。

在 1923 年当德日进发现了萨拉乌苏地层中的石器、破碎骨骼和狩猎的迹象时,正是他思考人的现象和人的思维在地球上形成一个智慧圈 (Noosphere) 的时期,那时他在面对萨拉乌苏的落日,面对鄂尔多斯草原和贺兰山后的大地曾想到“研究过去只是为了未来”。他可能并

没有想到, 80 年后荷兰人克鲁岑从智慧圈的思想吸取营养并提出人类世这一概念。今天萨拉乌苏的落日依旧是那样令人思考不尽。而面对萨拉乌苏我们将提出些什么呢?

《萨拉乌苏河晚第四纪地质与古人类综合研究》是这样一部专著, 它不仅仅是总结了过去, 而且启示了未来。它像许多重要的研究成果那样使读者们获得了思考新的工作, 新的方向, 和预期新的争论和新的答案的勇气和力量。这一宝贵的启示, 使著者们这些年来努力奋斗的成绩更为辉煌。

《萨拉乌苏河晚第四纪地质与古人类综合研究》的出版使地质界沉寂了多年的萨拉乌苏又焕发了青春!

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Foreword 1 Xarusgol (Sjara-osso-gol) River Region Sunset and Its Culture

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On the eve of August 9, 2006, when I was dining with the investigators in the just completed European-style Xarusgol Hotel, I suddenly looked up and saw a red sun outside slowly setting in the west—Xarusgol Sunset! It was so vivid and touching that I was moved by the beauty of the natural scene. Even more exciting, this natural beauty inspired a western scientist 83 years ago to create a new philosophical idea. Although this was the first time I had observed the sunset at Xarusgol, it felt like seeing old friends again whom I had been longing to see. This might be the reason why we, as geologists, paleolithic archaeologists, palaeontologists and anthropologists from all over the world, came to the steppe on the southern margin of the Ordos Desert to celebrate on the bank along the meander of Xarusgol River!—to celebrate the grassland culture festival, experience the culture of Xarusgol, commemorate E. Licent and P. Teilhard de Chardin, the French priests, who in 1922-1923, for the first time on Chinese soil conducted western modern paleontology and human archaeology research, and reviewed the new achievements made here in the past 83 years. It is the first meeting between western and eastern cultures in 83 years, which culminated in a truly meaningful discussion of the Eurasian grassland culture.

After dinner, I went into the yard and saw the end of the reservoir in front of the hotel, beyond the side of Helan Mountain, with the slowly setting sun. Its baffling brilliance is not the sunset that at the time caused P. Teilhard de Chardin to think about the history of the earth, and the future of the human race, is it! But today, we, the scientists from all over the world, have never met the world's famous paleontologists, P. Teilhard de Chardin and E. Licent: We are a younger generation. The magical sunset of Xarusgol brought surprise and meditation to the people. Like the flowing Xarusgol River it has become a symbol of the grassland culture. It will be the sunset that people will remember forever. It will always cause people to miss Xarusgol and reminisce about it.

Why do we commemorate Xarusgol culture?

Xarusgol is a type section in China's Quaternary terrestrial stratigraphy, especially in the biostratigraphic system. In China, there are three stratigraphic names that represent different eras: Nihewan (early pleistocene epoch), Zhoukoudian (middle pleistocene), and Xarusgol (late pleistocene). The three Quaternary type stratigraphies were scientifically defined. That is to say, from the date of the naming of the Xarusgol Formation, all of the Late Quaternary (the late pleistocene) strata in China will need to be compared to the type biostratigraphy of the Xarusgol Formation. This is one of the reasons why Xarusgol is famous and draws people here. What's more,

since last year (2005), the International Commission on Stratigraphy initiated a discussion on the Quaternary stratigraphic nomenclature and proposed to find solutions for Late Quaternary biostratigraphy with reference to the Xarusgol assemblage.

The second characteristic of Xarusgol, is that it is one of the first places in China where an early human stone industry was discovered. The Xarusgol stone industry, characterized by tiny stone tools, and use of bone artifacts, belongs to the Middle to Late paleolithic cultures. It is not only a standard place in China, but also occupies an important place in the history of cultural communication between China and the west. People will find the inspiration for Chinese Ordos to Europe cultural interaction on the grassland.

The third characteristic of Xarusgol, is perhaps the most important one. That is a human fossil, the Ordos tooth, found in the formation here—a front tooth belonging to a child discovered by P. Teilhard de Chardin and E. Licent at that time. But this front tooth broke the quiet of the Asian continent, and became a precursor to the discovery of human ancestors in the strata. Since then, people kept thinking about why the Xarusgol race and the large elephant (*Palaeoloxodon naumanni*) and rhinoceros (*Coelodonta antiquitatis*) were found together, and why horse (*E. cf. przewalskyi*) and deer (*Megaloceros ordosianus*) left leaving behind the stone tools.

People are more likely to ask if Xarusgol has been this dry for tens of thousands of years or if it was the result of climate change. Did people change the surrounding living organisms and the environment? Or did change in the climate and environment result in people to change? Or did they influence each other?

This was the state of knowledge and understanding about Xarusgol before the meeting.

We visited the Wushen County Museum, before the “International Academic Seminar of Xarusgol Site, Ordos” on August 8-12, 2006, listened to the reports of Dong Guangrong and many comrades during the meeting, visited the Xarusgol Paleolithic Site under their guidance, and read *Comprehensive Study of the Late Quaternary Geology and Paleoanthropology of the Xarusgol River Region*. This monograph gives us a lot of new knowledge about Xarusgol. This book has a good summary and analysis on the history of research of Xarusgol river region, the natural geographical landscape, stratigraphy, paleontology, the stone artifacts, paleoanthropology, and the geochemical environment etc. Here, I won't go into any details. What I want to say is that there are many bright features in this monograph, which should be put forward and advocated.

A scientific monograph demonstrates that the authors have been working hard and thinking deeply for many years. For the reader, its foresight and revelations could attract more attention rather than its comprehensiveness and summary.

This book of *Comprehensive Study of the Late Quaternary Geology and Paleoanthropology of the Xarusgol River Region* has three ground-breaking achievements and inspirations.

One of them is the stratigraphy. The authors have established a new “climate stratigraphy system” of the Xarusgol stratigraphy. On the basis of detailed studies of the lithostratigraphy,

biostratigraphy and chronology, and using the “Marine Isotope Stages” system which has been applied here by Sun Jimin *et al.*, Dong Guangrong, and Li Baosheng *et al.*, with new methods and materials, the stratigraphic classification and interpretation of the Xarusgol strata (including the Xarusgol Formation and the Chengchuan Formation etc.) This was not the first attempt, though, but it was a successful attempt at the classification and naming of continental strata in China’s Quaternary. It makes the division of the Xarusgol Quaternary strata basically comparative to the globally known deep-sea and Antarctic ice core oxygen isotope phase (MIS). This new concept of climate stratigraphy improves above all to a more accurate stratigraphic time division than before, makes a regional geological study into the framework of the stratigraphic system of global climate change, and in fact promotes the study of the stratigraphy of Xarusgol to a global change perspective.

In continental Quaternary stratigraphy, studies of climate stratigraphy and biogeochemical studies are inseparable. The Xarusgol area with such thick deposits and a combination of uniform and variable sediments, is very conducive to establish a type section to represent a “climate stratigraphy system” of the continental sedimentation that responds to the global change since the Late Pleistocene. To do this, geological and paleontological researchers like archaeologists, need to carry out studies of the whole section, like the deep-sea, Antarctic ice cores, and loess sequences. We should realize that from now on the study of climate stratigraphy will be the foundation of the entire Quaternary geological history. Whether it is to discuss the climate change in the future, or land reclamation, or restore the ecological environment, it is inseparable from an understanding of the historical evolutionary process of the past environment.

Another breakthrough and inspiration in this book is that the palaeontological work opens the way to new “paleoecology studies”. In addition to the existing published, and new publications the fossil materials were systematically studied and described in detail. The most valuable thought and work is the comprehensive analysis and induction of the important Xarusgol fauna, which is known now. The work makes the research on Xarusgol rise from a point to a side. And if this kind of research can be combined with the “climate stratigraphy system”, it will open up a new terrestrial stratigraphic study and surpass the research on deep-sea deposits, ice cores and loess.

Because if we consider these sediments from a global variation perspective, deep-sea deposits lack plants and animals except for marine microfauna; the creatures in the ice cores are more sparse, and although there are small amounts of animal and plant fossils in the loess, it is more difficult to fully recover them and study their features than of fauna of the terrestrial biosphere. The biological stratigraphic sections of the past, often due to site isolation, makes it difficult to develop hypotheses about the ancient ecological environment in a region, so it’s hard to get into the realm of real global change research.

This book lists the geographical distribution of the Xarusgol fauna, the most east of which is from Qian’an, Hebei, Xujiayao and Shiyu, west of Shanxi, as well as further west to Loufangzi,

Gansu; while the Chengchuan fauna from Guxiangtun, Heilongjiang to Dalian, Liaoning, Beijing's Upper Cave and Tianyuan Cave, and to Laochi River, Shanxi and again to Rouyuan south of Xarusgol.

Such an east-west extension of the natural geographical range and the ecological environment is of significance in the study of global change in China, and even in the world. There is a need to go further, in terms of the climatic framework of deep-sea oxygen isotope stages, and with reference to the regional distribution of the two faunas from the east to the west, conducting paleontology and paleoecology studies that will be able to contribute to research on global climate change and biological evolution. It will make Xarusgol a center of continental strata and global change research.

The third breakthrough and inspiration is a comprehensive study of the Xarusgol stone implements, the paleoanthropology and their cultures. This study is thorough, detailed, and with many materials, also a great challenge. Huang Weiwen et al. agreed with the analysis of P. Teilhard de Chardin *et al.*, who believed that the Xarusgol (Ordos) man even had hunting behavior. That makes me think that since the 1960s, Professor Paul Martin has been advocating the theory that in the Late Pleistocene, the disappearance of large mammals around the world was associated with human mass hunting. I am very interested in this theory, because from the west Xarusgol Formation and Chengchuan Formation, the two sets of strata are associated with each other, and it could roughly be determined that the Xarusgol Formation contains abundant human fossils and stone implements, in which large mammal remains are not only more numerous with signs of artificial modification, while this phenomenon has rarely been observed in the Chengchuan Formation. Conversely, in the newer strata equivalent in geological time to the Chengchuan Formation in the northeastern part of China (Guxiangtun and Yushu), the proportion of large mammals not only increased, but also show evidence of hunting for food. These clues remind us to think that in the midst of great changes in nature, people—hunters—play an important role. As Paul Martin recently noted, the extinction of large mammals around the world varies from place to place, as in Australia, 46,000 years ago, in America, 13,000 years ago, and in the West Indies, 5,000 years ago, and that it was related to the arrival of *Homo sapiens*. Whether that is so is yet to be scientifically proven. However, one thing is clear, i.e. if this is to be studied, Xarusgol will surely be one of the best places to prove it “yes” or “no”. So it is arguably the new world's “Xarusgol hunting culture”. Therefore one can say this monograph poses a new world-meaning of the “Xarusgol hunting culture”.

Another way of thinking caused by the Xarusgol culture is about the “Anthropocene”. When did it start? This is a more recent question that has been discussed. In 2000, Paul Crutzen, Nobel Prize Winner and others proposed that the Anthropocene began with the industrial revolution, represented by the invention of the steam engine in 1786, because human activity impacts on the earth's environment (greenhouse gases cause climate change) more than the natural geological processes.

Later on, the American scholar Williams Ruddiman proposed that the Anthropocene began with the introduction of agriculture (the release of methane in large quantities from greenhouse gases in

the soil). I think that the Xarusgol research, including that on the Xarusgol hunting culture (cooked food, use of fire, the manufacture of stone and bone artifacts, including tools, etc.), and the research of grassland ecological culture have preliminary shown that hunting is not only the life and production activities, and man (*Homo sapiens*) as early as the beginning of the changing global environment. The impact of human hunting activities not only on the atmosphere, and biosphere, and the soil circle and lithosphere is considerable, and compared to the influences of natural geological forces, has resulted in more considerable changes of the natural world. Making human beings become truly an unignorable geological force could have begun with hunting. So the Xarusgol study inspired us to propose that the “Anthropocene” should start from the age of hunting. Then I thought about the hunting by man, the large-scale hunts and kills and with fire etc. as revealed by research on the Xarusgol and Chengchuan Formations in various places, and that the behavior that causes the natural environment to change was different through time. I take this opportunity to offer my advice on the question.

In 1923, when P. Teilhard de Chardin found the stone implements, broken bones and signs of hunting in the Xarusgol Formation, was a time when he had been contemplating the noosphere of the earth and that it was formed by the phenomenon of people and human cognition. At that time, facing the sunset of Xarusgol, the land of the Ordos grassland and the floodplain behind the Helan Mountains, he thought, “studying the past is just for the future”. He may not have imagined that after 80 years, the Dutch man Krutzen took nourishment from the idea of the Noosphere and proposed the idea of the Anthropocene. Today the setting Sun of Xarusgol still inspires people to do a lot of thinking. Whereas facing Xarusgol, what are we going to put forward?

The monograph *Comprehensive Study of the Late Quaternary Geology and Paleoanthropology of the Xarusgol River Region* not only sums up the past, but also reveals the future. Like a number of important research results it makes readers think about the new tasks, new directions, and the expected new argument and new courage and strength of the answers. It gives the reader the courage and strength to think about new work, new directions, and prospective new arguments and new answers. This invaluable revelation has made the authors more brilliant in their achievement of hard work over the years.

The publication of *Comprehensive Study of the Late Quaternary Geology and Paleoanthropology of the Xarusgol River Region* will after many years of silence rejuvenate the Xarusgol research again!

September 11, 2006 in Beijing